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AN ILLUSTRATION OF ABNORMAL GLOBAL RADIATION VALUES

The distribution of global radiation over India is given by Rao and Ganesan (1972), which reveals that on average, radiation reaching ground during monsoon season is very low due to the general cloud cover of the season, although the extra-terrestrial radiation is high. However, during this season an analysis of daily global radiation charts of Pune reveals a frequent presence of abnormal values briefly lasting for less than a couple of minutes. These abnormally large values are attributed to multiple reflections from clouds and at times the value of radiation on the ground exceeds even the solar constant (Gates 1965, Mani *et al.* 1977). In the latter reference, reflections from surrounding snow clad hills also, at times, contributed to large transient values.

2. At Central Agrimet. Observatory, Pune global radiation on a horizontal surface is recorded by Moll-Gorczynski solarimeter. An illustration is made in Fig. 1 of the transient occurrences of such abnormal radiation values during the period 1 June to 15 July 1976 monsoon season at Pune.

During the above period, on 17 and 19 June sky is cloud-free over most of the day and the solarigrams on these two days except at some occasions approached that of a clear day curve. In the figure the solarigram of 17 June (thin curve) is given. A few pips due to clouding, particularly during the evening, are still present. The thick curve in the figure is the smoothed version of this. It may be assumed, that throughout the period from 1 June to 15 July, the magnitude of intensities of global radiation at various times of the day could not have exceeded the value determined by this curve, if the sky were cloud-free

for two reasons — (i) during the monsoon period atmospheric dust is low and the above solarigram corresponds to a clean atmospheric condition and (ii) day to day variation in total radiation at the top of the atmosphere is negligible during this period; say for 20°N latitude, values are 935, 935 and 930 cal/sq.cm/day on 29 May, 22 June and 15 July respectively (List 1951).

To evaluate the abnormal values, the solarigrams of each day during the period from 1 June to 15 July are superimposed on the thick curve and values lying off from this curve are shown in Fig. 1.

The figure reveals excessive values at all hour angles and it may be seen that the maximum magnification is generally limited to increase of the radiation at ground by an amount of about half of the clear sky value. The figure also reveals a few cases of reflections from clouds when radiative energy at ground on horizontal surface exceeded solar constant value. Besides, since the instrument cuts off long wave energy component, the total energy input is still higher. This possibility for such magnification seems to be at times slightly away from noon.

Fig. 2 is a schematic diagram, illustrating radiation features during clear and overcast sky conditions and how reflections/multiple reflections from clouds can contribute in addition to direct radiation if there are clear openings in a cloudy sky.

3. The contribution of these cloud reflections to the seasonal average and their influences on plant physiology may be of use for further study.

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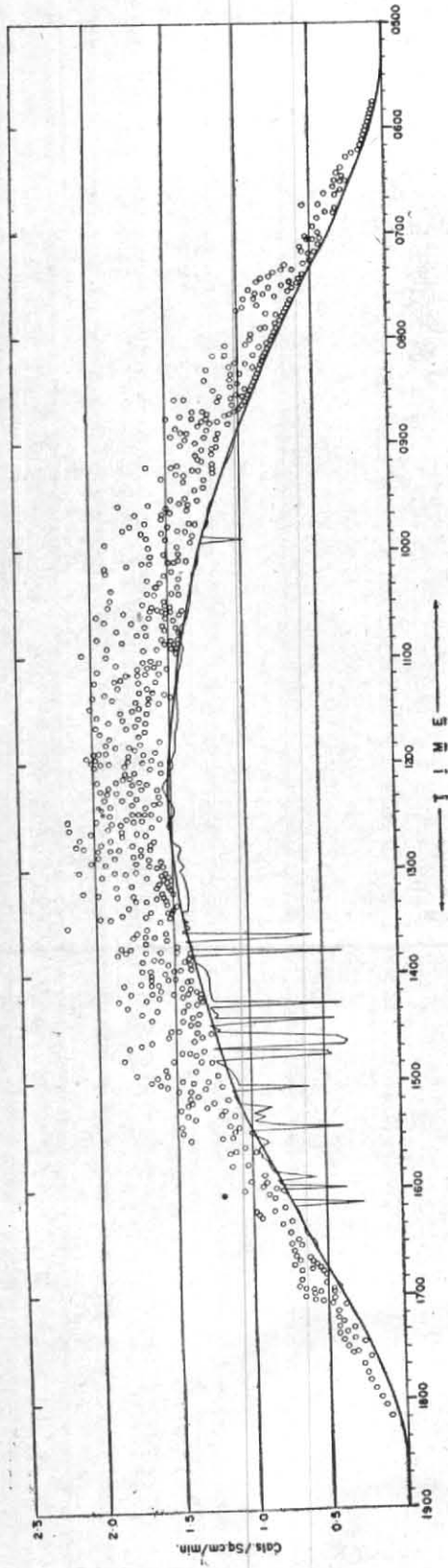


Fig. 1

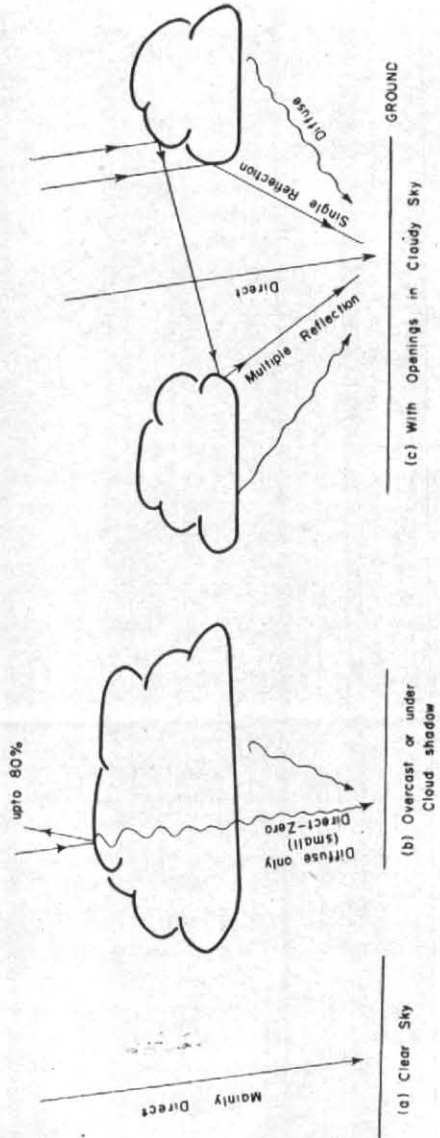


Fig. 2